

A new species of *Graemontia* Lawrence, 1931, from the Western Cape, South Africa, with notes on the relationships of the genus (Opiliones: Laniatores: Triaenonychidae)

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Graemontia viridiceps n.sp., is described from the southwestern part of South Africa. This is the seventh species of the genus and the second species for which male genitalia are described and illustrated. A key is given to all species of *Graemontia*. This genus is important for studying phylogenetic relationships within the family Triaenonychidae because, although traditionally placed in the tribe Triaenonychini, it shares some derived similarities with members of the tribe Triaenobunini, which is absent from Africa. If, as suggested, *Graemontia* is the sister group of the Triaenobunini, it provides corroboration for the biogeographical sequence (South Africa (southern South America, Australia, New Zealand)).

Key words: Opiliones, South Africa, new species, *Graemontia*.

INTRODUCTION

The family Triaenonychidae, with 479 described species, comprises the largest family of the Travunioidea (with 538 described species). These are small to medium-sized Laniatores distributed in the northern and southern temperate regions of the World, but also forming the dominant group of the opilionofauna of Madagascar, New Zealand and South Africa. There are a few genera from the United States, Japan and Korea, but none from Europe. In the Southern Hemisphere, they occur in Chile, Argentina, southern Brazil, South Africa (102 species), Madagascar (36 species), Australia and New Zealand. In South Africa there are members of the subfamily Triaenonychinae, tribes Triaenonychini (63 species) and Adaeini (39 species). As expected, since they are small cryptozoic animals, no common names have been recorded. The largest species of Triaenonychidae occur in Madagascar (Triaenonychini) and South Africa (Adaeini). In Chile they share importance with the family Gonyleptidae. Taxonomically, the family is distinguished by having single (instead of double) tarsal claws, with one or more pairs of lateral branches, exceptionally with more complex ramifications. Genitalia are complex, with many external sclerites and the glans complex is not articulated and restricted to a short apical section as in Cladonychiidae and Travuniidae.

The genus *Graemontia* was erected by Lawrence (1931) based on two species from the Eastern Cape, South Africa, one of the best sampled areas for Opiliones in Africa. Later Lawrence (1937, 1938) added two further species from KwaZulu-Natal. Kauri (1961) added one additional species from the vicinity of Cape Town in the Western Cape and finally Lawrence described a sixth species from Limpopo/Mpumalanga provinces (Lawrence 1963). Kauri (1961: 102) provided a key to the five species then known and Lawrence (1963) also provided a key to the six species then known, using a different order of diagnostic characters.

As a result of the South African National Survey of Arachnids (SANSA), a further new species was identified from the National Collection of Arachnids (NCA), Plant Protection Research Institute, Pretoria, South Africa (PPRI). This species originates from the eastern part of Western Cape, from where no species of *Graemontia* has hitherto been recorded.

Genus *Graemontia* Lawrence, 1931

Graemontia Lawrence, 1931: 413; Kauri 1961: 101; Staręga 1992: 285 (type species *Graemontia bifidens* Lawrence, 1931: 414, by subsequent designation, Staręga 1992).

Diagnosis. Body armed with two types of tubercles, 1) mushroom-like (pilzförmige Körnchen of Kauri 1961), rounded, swollen at their apices, which are

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bilobed or trilobed and 2) spiniform, setiferous, single-pointed tubercles, considerably longer than wide; anterior margin of carapace with a transverse frontal row of tubercles, which may be either of type 1 or 2; abdominal scute not divided by grooves into areas, these represented by more or less distinct rows or groups of tubercles, surface between tubercles smooth or with few small granules. Eye mound with a single terminal spine; stigmata hidden under clusters of small tubercles. Coxa I ventral with long, conical, setiferous tubercles along its anterior margin. Pedipalp heavily armed with numerous long, setiferous tubercles; inferior surface of femur without a median strip of fine granulation. Femur I with a ventral row of 4–7 powerful spines and a dorsal row of smaller spines. Calcaneus of legs I–IV much shorter than astragalus; median prong of claws of tarsi III and IV stronger than lateral prongs, inner lateral prong much weaker than outer lateral prong; tarsal segments 3/5–8/4/4; distitarsus I with two, II with two segments. Sexual dimorphism is not uniform and may be present in 1) basichelicerite, in male armed with a mesal apophysis which may be very large and bifid (as in *G. natalensis*) and/or with a dorso-apical apophysis which may be huge, curved, blunt and bilobed, resembling a *Brontoherium*-like (fossil ungulate mammal) horn (as in *G. bicornigera*), 2) pedipalpal femur, which may possess a very large, mid-mesal, blunt projection (as in *G. natalensis*). Male genitalia are undescribed for all previously known species, except *G. bicornigera*, which has a very sketchy illustration in the original description.

Included species. The genus now comprises seven species, namely: *Graemontia bicornigera* Lawrence, 1963; *G. bifidens* Lawrence, 1931 (type species); *G. decorata* Lawrence, 1938; *G. dentichelis* Lawrence, 1931; *G. erecta* Kauri, 1961; *G. natalensis* Lawrence, 1937; and *G. viridiceps* n.sp. described below.

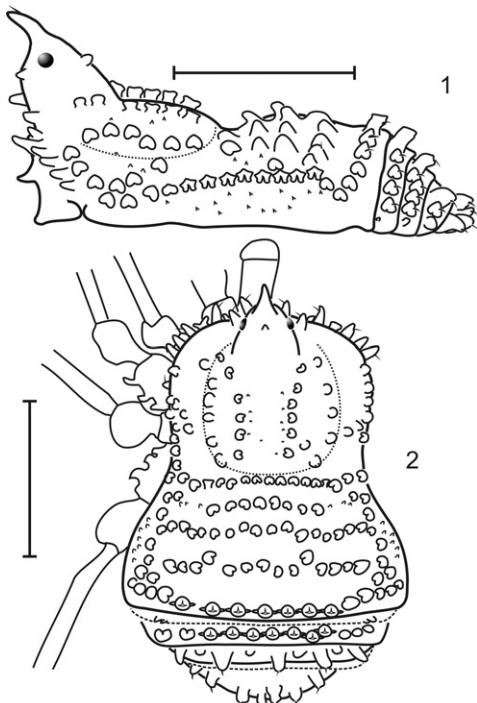
Distribution. The species of Laniatores in South Africa occur along the arch of thicket/forest/fynbos (corresponding to WWF ecoregions of Montane Shrubland, Mediterranean Forest and Tropical Moist Broadleaf Forest; <http://worldwildlife.org/science/ecoregions/afrotropic.cfm>) that extends clockwise from Limpopo Province and Mpumalanga through KwaZulu-Natal to the Eastern Cape and Western Cape (much of which is interspersed within savanna), excluding the grassland formations in Gauteng, North West Province and the Free State and the xeric formations of the Northern Cape (Fig. 12). The species of *Graemontia*

follow exactly this pattern, with marked allopatry, each species endemic to a separate area, without overlapping (Fig. 12). *G. viridiceps* occurs in a broadleaf forest area, which was hitherto a large gap in the distribution of the genus.

The distribution of the seven species of *Graemontia* according to the WWF Ecoregions is as follows: *G. bicornigera* (AT1004), *G. bifidens* (AT1004, AT1012 and AT0116), *G. decorata* (AT1004), *G. dentichelis* (AT1004, AT1012, AT1201), *G. erecta* (AT1203), *Graemontia natalensis* (AT1004) and *G. viridiceps* (AT0115). Therefore, most species occur in the type 10 (Montane Grasslands and Shrublands) and 12 (Mediterranean Forests, Woodlands & Shrub) biomes and only two of them in the 01 biome (Tropical & Subtropical Moist Broadleaf Forests).

Key to the seven species of *Graemontia*

1. Accessory spine on eye mound present, posterior to main spine, about half its length. Mushroom-like tubercles of carapace irregularly distributed *G. erecta* (Cape Peninsula)
- Without any accessory spine on eye mound. Mushroomlike tubercles of carapace forming a symmetrical pattern of areas 2
2. Pp Fe of male with large, spatulate latero-median apophysis. Setiferous tubercles of anterior margin of carapace very long, bilobed at the tip. Basichelicerite of male with powerful inner median bifid apophysis *G. natalensis* (KwaZulu-Natal)
- Pp Fe of male without such apophysis. Setiferous tubercles of anterior margin of carapace either short, mushroom-like, or long, single-tipped. Basichelicerite of male without such apophysis, at most with a small tooth. 3
3. Femur of leg I with the dorsal processes almost as long as those of ventral surface. Dorso-apical apophysis of basichelicerite, huge, curved, bifid as a *Brontoherium*-like horn *G. bicornigera* (Limpopo Province)
- Dorsal processes of femur I much shorter than the ventral ones. Dorso-apical apophysis of basichelicerite short and simple (bifid only in *G. decorata*) or lacking 4
4. Latero-apical apophysis of cheliceral hand of male very large, comparable to cheliceral fingers *G. decorata* (KwaZulu-Natal)
- Latero-apical apophysis of cheliceral hand of male small or absent 5



Figs 1–2. *Graemontia viridiceps*, male holotype (NCA AcAT 2001/131) from Groenkop, Western Cape, habitus; **1**, lateral view; **2**, dorsal view. Scale bars = 0.5 mm.

5. Paramedian armature of mesotergum clearly defined at areas I–IV. Setiferous tubercles of anterior margin of carapace short, mushroom-like 6
- Paramedian armature of mesotergum absent. Setiferous tubercles of anterior margin of carapace long, stout and simple *G. viridiceps* n.sp. (eastern Western Cape)
6. Frontal surface of cheliceral hand unarmed. Basichelicerite unarmed. *G. bifidens* (Eastern Cape)
- Frontal surface of cheliceral hand with three strong spines. Basichelicerite with one dorso-apical and one meso-distal spines *G. dentichelis* (Eastern Cape)

Graemontia viridiceps n.sp., Figs 1–12

Type material. ♂ holotype, 1♂, 1♀ paratypes (NCA AcAT 2001/131) South Africa. Western Cape Province. Groenkop, NE of George, Groeneweide Forest, with Berlese funnel from leaf litter, iii.1985, J.H. Koen col.

Etymology. Species name is a Latin translation of the Afrikaans name of the type locality, and means 'green head'.

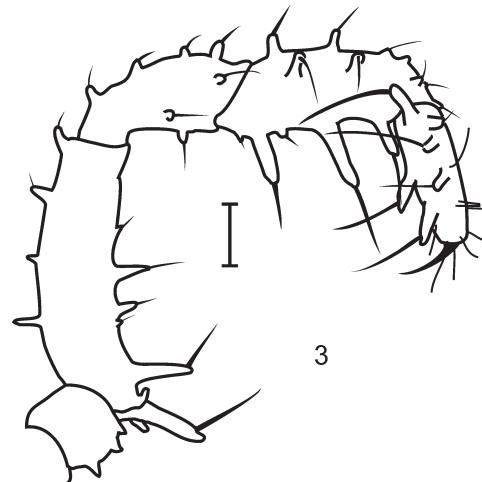


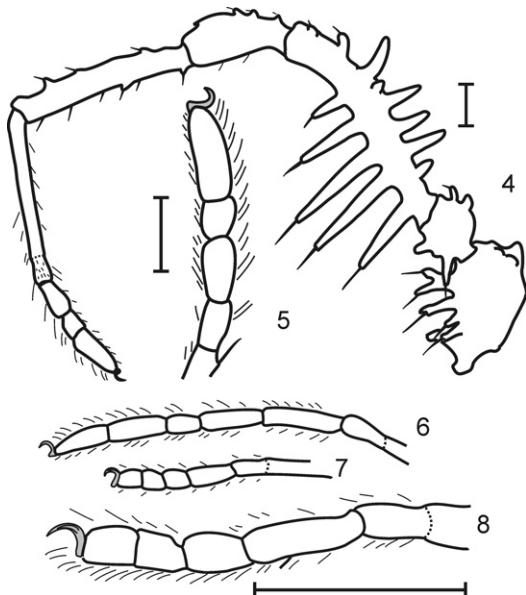
Fig. 3. *Graemontia viridiceps*, male holotype (NCA AcAT 2001/131); left pedipalpus, mesal view. Scale bar = 0.1 mm.

Distribution. Known only from the type locality, in WWF Ecoregion AT0115 (Knysna–Amatola Montane Forests).

Diagnosis. Frontal tubercles of carapace long and not bilobed (type 2). Mushroom-like tubercles of prosomal shield not arranged to delimit symmetrical areas. Basichelicerite and cheliceral hand of male without apophyses or processes. Pedipalpal femur slender, without large, blunt, median mesal apophysis. Distinguished from all other species of the genus by the shape of the tubercles at the anterior margin of carapace, which are stout and simple, instead of small, mushroom-like in most species, or very long and slender in *G. bicornigera*, and by a trimerous (instead of bimerous) distitarsus II (number of distitarsomeres not given for *G. erecta*). Distinguished from *G. erecta* by the lack of an accessory spine on the eye mound, tubercles of carapace organized in rows and lack of defined armature of mesotergum. *G. viridiceps* lacks all obvious sexual dimorphism in pedipalpus and chelicera typical of some species of the genus such as *G. natalensis* and *G. bicornigera*. Structure of penis seems to be very close (setation of ventral plate, same notch, shape of stylus, shape of valves of dorsal plate) to that of *G. bicornigera*, the only other species for which genitalia is illustrated, but lack of information on other species prevents any further comparison.

Description of male holotype

Measurements. Carapace (mm) 0.61 long, 0.70 wide; abdominal scute 0.47 long, 0.92 wide.

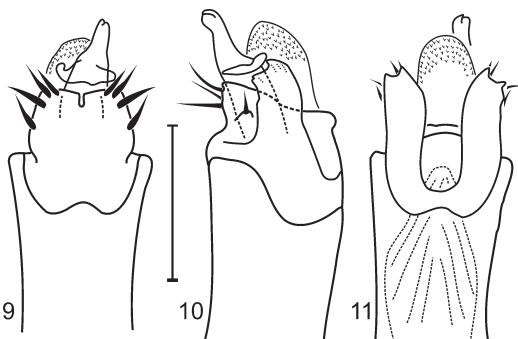


Figs 4–8. *Graemontia viridiceps*, male holotype (NCA AcAT 2001/131); **4**, left leg I, retrolateral view; **5**, same, detail of tarsus (scale bars = 0.1 mm); **6**, left tarsus II, lateral view; **7**, left tarsus III; **8**, left tarsus IV. Scale bar = 0.5 mm.

Dorsal scutum and free tergites (Figs 1–2). Scutum outline typical of the subfamily, pyriform asymmetrical or attenuate hourglass-shaped. Anterior margin of carapace with a transverse frontal row of setiferous tubercles. Eye mound elevated, conical, bearing an apical, setiferous, hooked process and a small dorsal tubercle. Eyes situated high, far from base of eye mound. No grooves marking scutal areas, only very faint groove marking carapace area. All areas without any paired process or spine. Setiferous mushroom-like tubercles in four longitudinal rows in the area of carapace, plus one pair of rows in the lateral margins. Also marking the boundaries of mesotergal areas. One transverse row of setiferous, mushroom-like tubercles on each free tergite I–III.

Chelicera. Without remarkable features, not sexually dimorphic.

Pedipalpus (Fig. 3). Trochanter with three ventral, pointed tubercles. Femur armed in the basal two-thirds with ventral row of four heavy, spiniform apophyses tipped with subdistally inserted setae. Two smaller setiferous tubercles also present. Also with dorsal row of four setiferous tubercles. Patella with two mesal, one ectal and four dorsal, setiferous tubercles. Tibia with three mesal, 3 + 2 ectal and five dorsal, setiferous tubercles. Tarsus



Figs 9–11. *Graemontia viridiceps*, male holotype (NCA AcAT 2001/131), distal part of penis; **9**, ventral view; **10**, lateral view; **11**, dorsal view. Scale bar = 0.1 mm.

with four mesal and two ectal, large, setiferous tubercles.

Legs (Figs 4–8). Coxa I armed ventrally with stout, setiferous tubercles. Trochanter I with two ventral and two dorsal setiferous tubercles. Femur I with ventral row of five sturdy, seta-tipped, spiniform apophyses and dorsal row of eight shorter, spiniform apophyses. Patella and tibia I with dorsal and ventral rows of small, setiferous tubercles. Coxa II with stout retrolateral spines; coxa IV with three dorso-prolateral, spiniform processes. Tarsal counts of legs I–IV: 3(2)/5(3)/4/4.

Colour. Body and appendages uniform light creamy brown.

Genitalia (Figs 9–11). Dorso-lateral plates only poorly developed, virtually absent. Ventral setiferous plate with small, U-shaped cleft on distal margin, three pairs of sub-apical and one pair of medial-lateral, straight setae. Dorsal plate deeply cleft into two valves. Stylus with median, transverse, foliaceous process and well-developed dorsal spiny sac.

Notes on the female. Indistinguishable from the male without dissection, both in appendage armature and in proportions.

Relationships of the genus *Graemontia*

The superfamily Travunioidea *sensu* Martens (1980) may be a paraphyletic group with respect to the Grassatores (Kury 2003). The Southern Hemisphere Triaenonychidae (including the type genus) probably form a clade, while the northern temperate genera are closest to the Travuniidae and Cladonychiidae. Among these Triaenonychidae *sensu stricto*, the specialized tribes Adaeini and Triaenobunini are possibly monophyletic groups, while the nominotypical tribe is a group defined

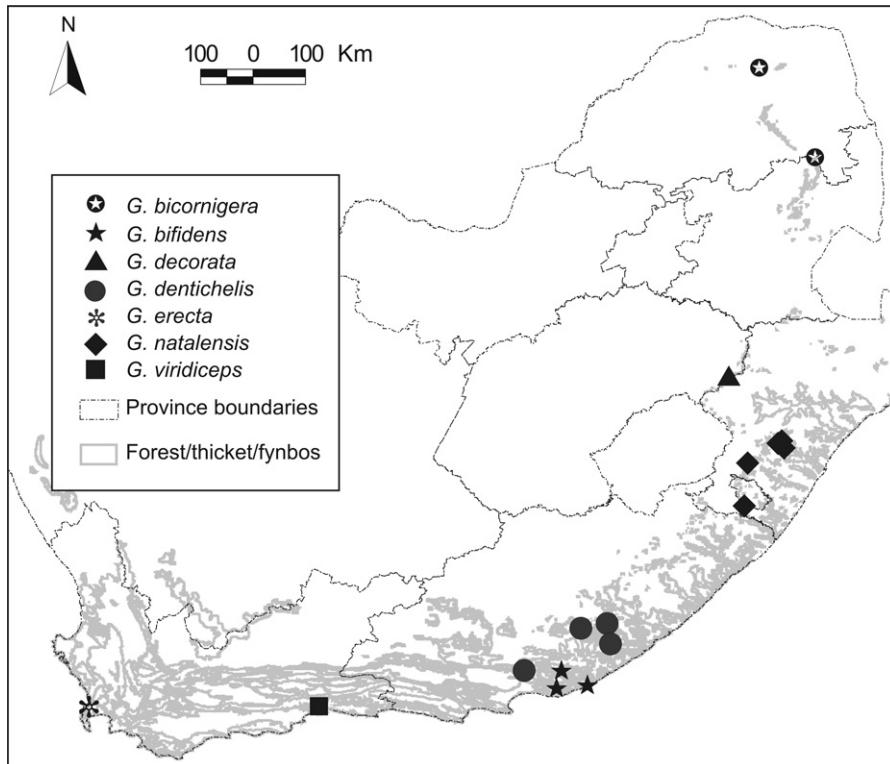


Fig. 12. South Africa, showing the geographic distribution of the species of *Graemontia* also relative to the vegetation

only by symplesiomorphies.

The tribe Triaenobunini is absent from South Africa, while there are a few species from Madagascar (Lawrence 1959) and the highest diversity of the group is in New Zealand (Forster 1954) and South America (Maury 1993; Kury, unpubl.). They are easily recognized by the unusual shape of the sternum and the grotesque eye mound, very long, with serrated margins and inclined frontwards. Even without those specializations, the genus *Graemontia* could be more closely related to the Triaenobunini than to the other Triaenonychini, because it shares with them 1) the strong armature of the frontal border of the carapace, 2) the heavy ventral and dorsal spination of leg I, 3) the shape of the ventral plate and 4) the deeply cleft dorsal plate of the penis, divided in two valves. But regarding male genitalia of the subfamily, only some South American and Australian species are described in enough detail, and a closer study of the relationships within the family with more basic groundwork is needed before more can be concluded. If *Graemontia* is indeed a basal member of the Triaenobunini (sister-group of the rest of the tribe), this pattern provides more support for

South African biota separating first from all other southern (temperate) Gondwanan landmasses (New Zealand, South America, Australia) as evidenced in many other taxa.

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